

REMARKS

Claims 1-34 are pending. Claims 1, 11, 13, 14, 16, 17, 18, 29, 30, 31, 32, 33, and 34 are amended. Claims 7, 8, and 12 have been cancelled without prejudice.

Claims 1-3, 5-6, 13, 14, 16-18, 25, and 28-34 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,193,340 ("Kamihara"). This rejection is respectfully traversed.

Claim 1 defines a method of controlling an exhaust filter regeneration regime and recites "injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering fuel injection dependent upon the exhaust stream temperature; pre-heating fuel to be injected with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history." Kamihara does not disclose such a method.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not "pre-heating fuel to be injected with vehicle waste heat," as recited by claim 1. Nor does it disclose "recording a regeneration regime history and modifying the regeneration regime based on the recorded history," as also recited by claim 1. Since Kamihara fails to disclose all of the limitations of independent claim 1, claim 1 is not anticipated by Kamihara. Claims 2-3 and 5-6 depend from independent claim 1 and are patentable for at least the reasons mentioned above. Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claim 13 defines a method of triggering an exhaust filter regeneration regime and recites “monitoring filter pressure peak values; identifying when a filter load exceeds a predetermined value from the monitored filter pressure peak values and triggering a regeneration regime; initiating fuel injection into an exhaust stream upon triggering the exhaust filter regeneration regime; pre-heating fuel to be injected with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a method.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 13. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as also recited by independent claim 13. Since Kamihara fails to disclose all of the limitations of independent claim 13, claim 13 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 14 defines a method of triggering an exhaust filter regeneration regime in which fuel is injected into an exhaust stream to increase exhaust stream temperature in conjunction with a catalytic treatment element and recites “obtaining a value of catalytic treatment element temperature; triggering the regeneration regime when the obtained temperature exceeds a predetermined value; pre-heating fuel to be injected with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a method.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 14. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as also recited by claim 14. Since Kamihara fails to disclose all of the limitations of independent claim 14, claim 14 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 16 defines a method of controlling an exhaust filter regeneration regime and recites “implementing an exhaust stream temperature control strategy; monitoring variation in exhaust stream temperature and at least one control parameter; obtaining a correlation between variation in exhaust stream temperature and the control parameter and adjusting the temperature control strategy based on the correlation obtained; pre-heating fuel to be injected into the exhaust stream with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a method.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 16. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as also recited by claim 16. Since Kamihara fails to disclose all of the limitations of independent claim 16, claim 16 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 17 defines an exhaust filter regeneration apparatus and recites “a fuel injector arranged to be mounted in an exhaust stream conduit; a controller for controlling the fuel injector, said fuel injector and said controller being configured to implement an exhaust filter regeneration regime comprising injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; and a metering of fuel injection dependent upon the exhaust stream temperature; wherein the apparatus is further arranged to pre-heat fuel to be injected with vehicle waste heat, record a regeneration regime history, and modify the regeneration regime based on the recorded history. Kamihara does not disclose such an apparatus.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not an apparatus “arranged to pre-heat fuel to be injected with vehicle waste heat,” as recited by claim 17. Nor does it disclose an apparatus “arranged to record a regeneration regime history and modify the regeneration regime based on the recorded history,” as recited by claim 17. Since Kamihara fails to disclose all of the limitations of independent claim 17, claim 17 is not anticipated by Kamihara. Claims 25 and 28 depend from claim 17 and are patentable for at least the reasons mentioned above. Applicants respectfully request that the rejections be withdrawn and the claims allowed.

Claim 18 defines an exhaust filter regeneration apparatus and recites “an exhaust stream conduit and a fuel injector mounted therein and arranged to inject fuel in an exhaust stream direction and pre-heat fuel to be injected with vehicle waste heat; wherein the apparatus is further

arranged to record a regeneration regime history and modify the regeneration regime based on the recorded history.” Kamihara does not disclose such an apparatus.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not “a fuel injector mounted therein and arranged to inject fuel in an exhaust stream direction and pre-heat fuel to be injected with vehicle waste heat,” as recited by claim 18. Nor does it disclose an apparatus “further arranged to record a regeneration regime history and modify the regeneration regime based on the recorded history,” as recited by claim 18. Since Kamihara fails to disclose all of the limitations of independent claim 18, claim 18 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claim 29 defines a computer readable medium storing a set of instructions to operate a computer arranged to implement an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering fuel injection dependent upon the exhaust stream temperature; pre-heating fuel to be injected with vehicle waste heat; recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a computer.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not a computer arranged to operate under the instructions of a computer program with instructions to implement an exhaust

filter regeneration regime comprising “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 29. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as recited by claim 29. Since Kamihara fails to disclose all of the limitations of independent claim 29, claim 29 is not anticipated by Kamihara. Claim 30 depends from claim 29 and is patentable for at least the reasons mentioned above. Applicants respectfully request that the rejections be withdrawn and the claims allowed.

Claim 31 defines an engine control unit configured to implement an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering fuel injection dependent upon the exhaust stream temperature; pre-heating fuel to be injected with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a device.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not an engine control unit configured to implement an exhaust filter regeneration regime comprising “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 31. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as is recited by claim 31. Since Kamihara fails to disclose all of the limitations of independent claim 31, claim 31 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 32 defines a computer readable medium storing a set of instructions to operate a computer arranged to implement an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering fuel injection dependent upon the exhaust stream temperature; pre-heating fuel to be injected with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a computer.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not a computer arranged to operate under the instructions of a computer program with instructions to implement an exhaust filter regeneration regime comprising “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 32. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as recited by claim 32. Since Kamihara fails to disclose all of the limitations of independent claim 32, claim 32 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 33 defines a method of controlling exhaust and recites “increasing an exhaust stream temperature; controlling said increasing an exhaust stream temperature in conjunction with a catalytic treatment element; metering fuel injection dependent upon said exhaust stream temperature; pre-heating fuel to be injected with vehicle waste heat; recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such a method.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not “pre-heating fuel to be injected with vehicle waste heat,” as recited by claim 33. Nor does it disclose “recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Since Kamihara fails to disclose all of the limitations of independent claim 33, claim 33 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 34 defines an apparatus for controlling exhaust and recites “means for increasing an exhaust stream temperature; means for controlling said increasing an exhaust stream temperature in conjunction with a catalytic treatment element; means for metering fuel injection dependent upon said exhaust stream temperature; means for pre-heating fuel to be injected with vehicle waste heat; and means for recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Kamihara does not disclose such an apparatus.

Kamihara discloses improving an exhaust gas purifying system by controlling the amount of fuel supplied to the trap filter (column 2, lines 45-50), but not an apparatus comprising “means for pre-heating fuel to be injected with vehicle waste heat,” as is recited by claim 34. Nor does it disclose “means for recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as is recited by claim 34. Since Kamihara fails to disclose all of the limitations of independent claim 34, claim 34 is not anticipated by Kamihara. Applicants respectfully request that the rejection be withdrawn and the claim allowed.

Claim 11 stands rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,492,079 (“Takagi”). This rejection is respectfully traversed.

Claim 11 recites “A method of triggering an exhaust filter regeneration regime comprising obtaining a value of filter load as function of a filter pressure and an exhaust mass flow and triggering a regeneration regime when the filter load exceeds a predetermined value; initiating fuel injection into an exhaust stream upon triggering the exhaust filter regeneration regime; pre-heating fuel to be injected with vehicle waste heat; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Takagi does not disclose this feature.

Takagi discloses a method of detecting and controlling the degree of clogging of a particle-trapping member of an internal combustion engine, but makes no mention of accomplishing this by “initiating fuel injection into an exhaust stream,” as is recited by amended claim 11. Since Takagi fails to disclose all the limitations of independent claim 11, claim 11 is not anticipated by Takagi. Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of U.S. Patent No. 4,535,588 (“Sato”). This rejection is respectfully traversed.

Claim 4 depends from independent claim 1 and is patentable over Kamihara alone for at least the reasons mentioned above. Sato, which has been cited as allegedly teaching that the fuel injection is metered dependent upon the temperature of exhaust gas, does not cure the deficiencies of Kamihara discussed above. Sato fails to disclose either “pre-heating fuel to be injected with

vehicle waste heat” or “recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” Accordingly, Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claim 7 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of U.S. Patent No. 7,000,384 (“Kagenishi”). Claim 7 has been cancelled and the rejection is moot.

Claims 8 and 27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of U.S. Patent No. 5,412,946 (“Oshima”). This rejection is respectfully traversed. Claim 8 has been cancelled and the rejection is moot.

Claim 27 depends from independent claim 17 and is patentable over Kamihara for at least the reasons mentioned above. Oshima, which has been cited as teaching pre-heating fuel to be injected into the exhaust gas with vehicle waste heat, does not cure the deficiencies of Kamihara discussed above, namely “recording a regeneration regime history and modifying the regeneration regime based on the recorded history.”

Additionally, Oshima does not teach pre-heating fuel to be injected with vehicle waste heat. Oshima discloses an H₂ generator (11) wherein methanol is injected into a coiled tube positioned within an exhaust conduit (113). The H₂ generator of Oshima does not pre-heat fuel to be injected into the exhaust stream. Instead, it fundamentally changes the chemical composition of the fuel, turning it into H₂, with the sole aim of reacting with and decreasing the amount of NO_x in the exhaust gas (column 7, lines 1-14). Thus, Oshima does not cure the deficiencies of Kamihara

noted above. Accordingly, Applicant respectfully requests that the rejection be withdrawn and the claims allowed.

Claims 9 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of U.S. Patent No. 5,884,475 (“Hoffman”). This rejection is respectfully traversed. Claims 9 and 10 depend from independent claim 1 and are patentable over Kamihara for at least the reasons mentioned above. Hoffman, which has been cited as teaching a reducing agent mixed with compressed air in an injection head, does not cure the deficiencies of Kamihara discussed above. Hoffman does not teach “pre-heating fuel to be injected with vehicle waste heat” nor “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as is required by claims 9 and 10. Accordingly, Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claim 12 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Takagi in view of Kamihara. Claim 12 has been cancelled and the rejection is moot.

Claim 15 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of Takagi. This rejection is respectfully traversed. Claim 15 depends from independent claim 14 and is patentable over Kamihara for at least the reasons mentioned above relating to claim 15. Takagi, which has been cited as teaching obtaining a value of a filter load as a function of a filter pressure and an exhaust mass flow and triggering the regeneration regime when the filter load exceeds a predetermined value, does not cure the deficiencies of Kamihara discussed above. Takagi does not disclose “pre-heating fuel to be injected with vehicle waste heat” nor “recording a

regeneration regime history and modifying the regeneration regime based on the recorded history,” as is recited by claims 14 and 15. Accordingly, Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claims 19, 20, and 22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of U.S. Patent No. 6,192,677 (“Tost”). This rejection is respectfully traversed. Claims 19, 20, and 22 depend from claim 18 and are patentable over Kamihara for at least the reasons mentioned above. Tost, which has been cited as allegedly teaching a fuel injector having a fuel input channel and an air input channel, does not cure the deficiencies of Kamihara discussed above. Tost is directed to treating exhaust gases for an internal combustion engine operating with excess air, but does not disclose “pre-heating fuel to be injected using vehicle waste heat” nor “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as recited by the claims. Accordingly, Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Claim 21 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of Tost as applied to claim 20, and further in view of U.S. Patent No. 7,140,874 (“Ingalls Jr.”). This rejection is respectfully traversed. Claim 21 depends from independent claim 18 and is patentable over Kamihara in view of Tost for at least the reasons mentioned above. Ingalls Jr. does not cure the deficiencies of the would-be modified Kamihara system, namely “pre-heating fuel to be injected with vehicle waste heat” or “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” as recited by the claims. Accordingly, Applicants respectfully request that the rejection be withdrawn and the claims allowed.


Claims 23, 24, and 26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kamihara in view of U.S. Patent No. 5,388,406 (“Takeshima”). This rejection is respectfully traversed. Claims 23, 24, and 26 depend from claim 17 and are patentable over Kamihara for at least the reasons mentioned above. Takeshima does not cure the deficiencies of Kamihara, specifically it fails to disclose “pre-heating fuel to be injected with vehicle waste heat,” as recited by the claims. Takeshima discloses an electric heater that heats NO_x absorption and release material, but does not disclose pre-heating fuel. Accordingly, Applicants respectfully request that the rejection be withdrawn and the claims allowed.

Although not specifically made in the Office Action, Applicants respectfully submit that a combination of Kamihara with two or more of the above references would not teach or suggest the features and limitations of the pending claims. Each of the prior art documents lacks either the features of “pre-heating fuel to be injected with vehicle waste heat” or “recording a regeneration regime history and modifying the regeneration regime based on the recorded history,” features which are recited by all of the independent claims. Further, there is no teaching or motivation in the cited documents to combine them, so as to produce an apparatus or perform a method as recited in the claims; many of the references are not directed towards regenerating an exhaust filter.

In view of the above, applicants believe the pending application is in condition for allowance. A notice of allowance is respectfully requested.

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